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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
DANIELS, MATTHEW J	

ART UNIT	PAPER NUMBER
1732	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/699,442	ROBERTS ET AL.	
	Examiner	Art Unit	
	Matthew J. Daniels	1732	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 October 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-32* is/are pending in the application.

4a) Of the above claim(s) *24* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23 and 25-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☒ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *10/29/03*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1-23 and 25-32, drawn to methods of making, classified in class 264, subclass 255.

II. Claim 24, drawn to a film, classified in class 136, subclass 263.

2. The inventions are distinct, each from the other for the following reasons: Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case, the product could be made by another and materially different method, such as sequential spraying of the polymerizable components onto the substrate instead of the imprinting process claimed in the instant application.

3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, recognized divergent subject matter, and because the search required for group II is not required for group I, restriction for examination purposes as indicated is proper.

4. During a telephone conversation with Charlene Haley on 15 September 2005 a provisional election was made without traverse to prosecute the invention of Group I, claims 1-23 and 25-32. Affirmation of this election must be made by applicant in

replying to this Office action. Claim 24 is withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

5. A restriction of species was also made by the Examiner for the various nanocrystals or nanoparticles sought in claims 1, 6, 7, 25, and 31. However, this species requirement is withdrawn by the Examiner.

6. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Oath/Declaration

7. The oath or declaration is defective. A new oath or declaration in compliance with 37 CFR 1.67(a) identifying this application by application number and filing date is required. See MPEP §§ 602.01 and 602.02.

The oath or declaration is defective because:

It does not identify the mailing address of each inventor. A mailing address is an address at which an inventor customarily receives his or her mail and may be either a home or business address. The mailing address should include the ZIP Code designation. The mailing address may be provided in an application data sheet or a supplemental oath or declaration. See 37 CFR 1.63(c) and 37 CFR 1.76.

Specifically, no city is identified for the second named inventor, Scott K. Johnson.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., In re Berg, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); In re Goodman, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); In re Longi, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); In re Van Ornum, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); In re Vogel, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and In re Thorington, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

8. **Claims 1-32** are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-36 of copending Application No. 10/699,440. Although the conflicting claims are not identical, they are not patentably distinct from each other for the following reasons:

Each of the claims of the instant application appears to be substantial duplicate of a corresponding claim of the '440 application except that the instant claims are drawn to a method, and the '440 claims are drawn to a film which incorporates the same method limitations as those of the instant application. The '440 claims are obvious over the claims of the instant application because the claimed film would be a natural result of the process claimed in the instant application. The instant claims are obvious over the claims

of the '440 application because they include the same method limitations already sought in the '440 application. In particular, note the incorporation of substantially the same subject matter in the following claims:

10/699,440	10/699,442
Claims 1, 14, 35	Claims 1, 25, and 31
Claims 2-8	Claims 2, 4-9
Claims 9-11, 13	Claims 10, 11, 14, 23
Claim 15	Claims 3, 27
Claims 16, 17	Claims 4, 5
Claims 18, 19	Claims 6, 7
Claims 20, 21, 22	Claims 8, 9, 12
Claims 23-31	Claims 13-17, 20-23
Claims 34, 35, 36	Claims 30, 25, 32

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented. A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome this provisional rejection.

9. Additionally, it should be noted that application 11/240,784 is a divisional of the instant application resulting from the restriction requirement above.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

10. **Claims 1, 9, 13, 21, 29, 31, 32** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. **As to Claim 1**, the claim recites at least one substrate, but in the body of the claim, a second substrate is particularly recited. Therefore, there are always at least two, and can never be only one substrate. **As to Claim 9**, the language "from up to about 100 nm" renders this claim indefinite. In this case it is unclear whether a range is sought ("from...up to"), or whether the limitation of "about 100 nm" is sought. **As to Claim 13**, the limitation "TiOx" is recited in the claim. It is unclear and indefinite whether the "x" is directed to a generic formula encompassing either TiO or TiO2, or both, or is a typographical error. The Examiner submits that nanometer size particles may include particles having the formula TiOx where x is 1 or 2. However, because no nanometer-sized particle can have a formula that is "TiOx", the claim is indefinite. **As to Claim 21**, the claim recites the limitation "said substrate". Claim 1 recites two substrates, making this claim indefinite. **As to Claim 29**, the limitation "said photoabsorbing material" lacks antecedant basis because there is no "material" in the independent claim. There appears to be only a photoabsorbing conjugated polymer. The limitation to "material" and the other materials recited in Claim 29 appear to broaden the claim scope. **As to Claim 31**, the claim recites the limitation of "providing at least one polymerizable layer including a polymer;" (emphasis added). The Examiner submits that this claim is indefinite because by including a "polymer", it is

already polymerized. It is noted that Claim 1 instead appears to recite a monomer. **As to Claim 32**, "said polymer" lacks antecedent basis because at least two polymers are recited in Claim 31.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. **Claims 1-4, 8-11, 19-21** are rejected under 35 U.S.C. 103(a) as being unpatentable over Petritsch (WO 99/49525) in view of Nakamura (USPN 6291763). **As to Claim 1**, Petritsch teaches a method of making films surface imprinted with nanometer-sized particles to produce micro- and/or nano-structured electron and hole collecting interfaces (Page 8 and elsewhere), comprising:

providing at least one transparent substrate (Page 9, line 7, Page 10, line 16);

providing at least one photoabsorbing conjugated polymer (Page 9, line 17);

providing a sufficient amount of nanometer-sized particles to produce a charge separation interface (Page 8, lines 9-31);

embedding said nanometer-sized particles in said conjugated polymer (Page 8, lines 13-19);

applying the transparent layer on a first said substrate to form a charge transport film layer (Page 10, first paragraph of embodiment 1);

applying said conjugated polymer/nanometer-sized particle mixture on a second said substrate to form a nanometer-sized particles bearing surface film layer, wherein said nanometer-sized particles form a stamp surface (Page 10, first paragraph of embodiment 1);

imprinting said stamp surface into the surface of the second film layer to produce micro- and/or nano-structured electron and hole collecting interfaces (Page 8, lines 9-12 and Page 11, lines 10-21);

Petritsch appears to be silent to a) providing at least one transparent polymerizable layer including a sol-gel or monomer, b) polymerizing said polymerizable film layer to promote shrinkage to form a conformal gap between said stamp surface and said surface of said polymerizable film layer, and c) filling said gap with at least one photoabsorbing material to promote the generation of photoexcited electrons and transport to the charge separation interface.

However, Nakamura teaches a) providing at least one transparent polymerizable layer including a sol-gel or monomer (26:16-27:25), b) polymerizing said polymerizable film layer to promote shrinkage to form a gap between said stamp surface and said surface of said polymerizable film layer (26:16-36, 28:51-62), and c) filling a gap with at least one photoabsorbing material to promote the generation of photoexcited electrons and transport to the charge separation interface (12:53-66, 28:51-62).

It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Nakamura into that of Petritsch because Petritsch specifically suggests modifying the interface to improve performance (Page 13, bottom to Page 14, middle), which Nakamura provides (4:6-45) in the form of a

charge separation interface. **As to Claim 2**, the claimed application methods are common in the art. Nakamura teaches at least dip coating (6:57). **As to Claim 3,** Petritsch teaches heating above the glass transition temperature, laminating, and thereafter cooling (Page 11, middle), which would solidify the stamp surface when used in combination with the polymerizable layer of Nakamura. **As to Claim 4**, Petritsch teaches Buckminsterfullerenes (Page 8, middle), which are known to have a particle size between 1 nm and 1 cm. **As to Claims 8 and 9**, Nakamura teaches 100 microns (7:35-37), and moreover teaches that there is a favorable thickness range (7:35-36), which appears to teach that layer thickness represents a result effective variable. **As to Claims 10 and 11**, Nakamura teaches a monomer and a sol-gel (26:16-27:36). **As to Claim 19**, Petritsch teaches at least PET (Page 14, bottom). **As to Claim 20**, Nakamura teaches at least ITO (6:29). **As to Claim 21**, Petritsch teaches poly(thiophene) and its derivatives (Page 8, middle), as does Nakamura (28:1-30).

12. **Claims 5-7** are rejected under 35 U.S.C. 103(a) as being unpatentable over Petritsch (WO 99/49525) in view of Nakamura (USPN 6291763), and further in view of Huynh (Science, Vol. 295, Issue 5564, March 29, 2002, page 2425). Petritsch and Nakamura teach the subject matter of Claims 1 and 4 above under 35 USC 103(a). **As to Claims 5-7**, Petritsch and Nakamura appear to be silent to the claimed limitations. However, Nakamura specifically suggests CdSe (4:56, 4:63). Huynh teaches metal nanowires of CdSe having the claimed composition, size, and aspect ratio (Page 1 of 6, 7 nanometer by 60 nanometer rods of CdSe, which is interpreted to be a metal nanowire). It would have been prima facie obvious to one of ordinary skill in the art at the time of

the invention to incorporate the method of Huynh into that of Petritsch and Nakamura because doing so provides the ability to control the band gap by changing the size of the nanowires/nanorods (Page 2, paragraph beginning with "One way...").

13. **Claims 12 and 13** are rejected under 35 U.S.C. 103(a) as being unpatentable over Petritsch (WO 99/49525) in view of Nakamura (USPN 6291763), and further in view of Barlow (USPN 4204933). Petritsch and Nakamura teach the subject matter of Claim 1 above under 35 USC 103(a). **As to Claim 12**, Petritsch and Nakamura appear to be silent to the claimed limitation of electrophoretic deposition. However, electrophoretic deposition of particles is old in the photovoltaic art. Barlow teaches that one of the benefits of deposition by electrophoretic deposition (1:29-35) of colloidal, nanometer size particles (1:55-62) is the ability to prepare solar cells from a few millimeters square to many square meters (8:61-66), which would be obviously desirable to one in the art in increasing the size, scale, and economy of the process and devices. Therefore, it would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Barlow into that of Petritsch and Nakamura in order to provide the benefits of increased size and scale. **As to Claim 13**, Nakamura teaches TiO2 as one of the preferred semiconductors (4:62).

14. **Claims 14- 16** are rejected under 35 U.S.C. 103(a) as being unpatentable over Petritsch (WO 99/49525) in view of Nakamura (USPN 6291763), and further in view of Grant (J. of Electroanalytical Chemistry, Vol. 522, March 2002, pages 40-48). Petritsch and Nakamura teach the subject matter of Claim 11 above under 35 USC 103(a). **As to**

Claims 14-16, Petritsch and Nakamura appear to be silent to the claimed limitations. However, it is submitted that the recited process is known in the photovoltaic art as a sol-gel preparation method. In particular, Grant teaches 10 milliliters of 100% ethanol, 250 microliters of Milli-Q water, titanium oxide (pages 42 and 43, section 2.4), and a metal organic compound of titanium isopropoxide (second paragraph of section 2.4, page 42). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Grant into that of Petritsch and Nakamura because Nakamura suggests a sol-gel layer of TiO2 (4:62 and 26:16-28:50), and Grant teaches a known method for preparing a titania sol-gel layer capable of producing films that are thinner than other methods (Page 44, left column, first paragraph), which would reduce the overall thickness of the device and help improve efficiency.

15. **Claim 17** is rejected under 35 U.S.C. 103(a) as being unpatentable over Petritsch (WO 99/49525) in view of Nakamura (USPN 6291763), and further in view of Helms (USPN 5186813). Petritsch and Nakamura teach the subject matter of Claim 10 above under 35 USC 103(a). **As to Claim 17**, Petritsch and Nakamura are silent to the claimed monomers, but teach the claimed compounds as polymers (28:1-30). Helms teaches monomers, including pyrrole, which form part of an electrolyte solution being deposited onto a substrate (5:47-6:52). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Helms into that of Petritsch and Nakamura because Helms teaches that lower oxidation potential monomers, such as pyrrole, may be electropolymerized to form uniform layers on large surface area

oxide coated substrates, which would allow production of larger and more uniform solar cells.

16. **Claim 18** is rejected under 35 U.S.C. 103(a) as being unpatentable over Petritsch (WO 99/49525) in view of Nakamura (USPN 6291763), and further in view of Yamakita (USPN 4647348). Petritsch and Nakamura teach the subject matter of Claim 1 above under 35 USC 103(a). **As to Claim 18**, the cited references appear to be silent to silicon or a silicate. However, silicon substrates are common for photovoltaics. In particular, Yamakita teaches that excellent adhesion can be achieved between thiophene and silicon, and that the semiconductor endures protracted use (3:50-60, 1:54-2:10)

17. **Claims 22 and 23** are rejected under 35 U.S.C. 103(a) as being unpatentable over Petritsch (WO 99/49525) in view of Nakamura (USPN 6291763), and further in view of Shaheen (Applied Physics Letters, Vol. 78, Num. 6, page 841) and Mitra (US Patent Application Publication 2004/0256001). Petritsch and Nakamura teach the subject matter of Claim 1 above under 35 USC 103(a). **As to Claims 22 and 23**, Petritsch and Nakamura teach that polythiphenes and their derivatives are known in the art. Petritsch and Nakamura are silent to polybutylthiophene dissolved in chlorobenzene. However Shaheen teaches that a chlorobenzene-based device with thiophene is much more efficient at converting photons to electrons (page 842, right column, paragraph beginning with "A plot..."). Additionally, Mitra teaches that it is known to manufacture photovoltaic cells using nanocrystals and polymers of polybutylthiophene (Par. [0037]). It would have been prima facie obvious to one of ordinary skill in the art at the time of

the invention to incorporate the methods of Shaheen and Mitra into that of Petritsch and Nakamura in order to provide much more efficient devices and because Petritsch suggests derivatives of polythiophenes, and Mitra provides polybutylthiophene, a polythiophene derivative.

18. **Claims 25-28 and 30** are rejected under 35 U.S.C. 103(a) as being unpatentable over Petritsch (WO 99/49525) in view of Nakamura (USPN 6291763), Ago (Advanced Materials, Vol. 11, Num. 15, 1999, pages 1281-1285), and Mitra (US Patent Application Publication 2004/0256001). **As to Claim 25**, Petritsch teaches a method of making film surfaces having nano-structured interfaces comprising:

providing at least one transparent substrate (Page 9, line 7, Page 10, line 16);

providing at least one photoabsorbing conjugated polymer (Page 9, line 17);

providing a sufficient amount of nanometer-sized particles to produce a charge separation interface (Page 8, lines 9-31);

embedding nanometer-sized particles in said conjugated polymer (Page 8, lines 13-19);

applying the transparent layer on a first said substrate to form a charge transport film layer (Page 10, first paragraph of embodiment 1);

applying the conjugated polymer/nanometer-sized particle mixture on a second said substrate to form a nanometer-sized particles bearing surface film layer, wherein said nanometer-sized particles form a stamp surface (Page 10, first paragraph of embodiment 1);

imprinting said stamp surface into the surface of the second film layer to produce micro- and/or nano-structured electron and hole collecting interfaces (Page 8, lines 9-12 and Page 11, lines 10-21);

Petritsch appears to be silent to a) multi-walled nanotubes, b) polybutylthiophene, c) providing at least one transparent polymerizable layer including a sol-gel or monomer, d) polymerizing the polymerizable film layer to promote shrinkage to form a conformal gap between said stamp surface and said surface of said polymerizable film layer, and e) filling said gap with at least one photoabsorbing material to promote the generation of photoexcited electrons and transport to the charge separation interface.

However, Ago teaches a) MWNT combined with conjugated polymers (first page, right column).

Mitra teaches b) that it is known to manufacture photovoltaic cells using nanocrystals and polymers of polybutylthiophene (Par. [0037]).

Nakamura teaches c) providing at least one transparent polymerizable layer including a sol-gel or monomer (26:16-27:25), d) polymerizing said polymerizable film layer to promote shrinkage to form a gap between said stamp surface and said surface of said polymerizable film layer (26:16-36, 28:51-62), and e) filling a gap with at least one photoabsorbing material to promote the generation of photoexcited electrons and transport to the charge separation interface (12:53-66, 28:51-62).

It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the methods of Nakamura, Mitra, and Ago into that of Petritsch for the following reasons:

1) Petritsch specifically suggests modifying the interface to improve performance (Page 13, bottom to Page 14, middle), which Nakamura provides (4:6-45) in the form of a charge separation interface.

2) Petritsch suggests derivatives of polythiophenes, and Mitra provides polybutylthiophene, a polythiophene derivative.

3) Ago teaches that multi-walled nanotubes act differently than fullerenes (which Petritsch teaches) and provide a good electrode which also offers an attractive route to reinforce the films and introduce new electronic properties based on morphological modification or electronic interaction between the components.

As to Claim 26, the claimed application methods are common in the art. Nakamura teaches at least dip coating (6:57). **As to Claim 27**, Petritsch teaches heating above the glass transition temperature, laminating, and thereafter cooling (Page 11, middle), which would solidify the stamp surface when used in combination with the polymerizable layer of Nakamura. **As to Claim 28**, Nakamura teaches at least ITO (6:29). **As to Claim 30**, at least Petritsch and Nakamura teach photovoltaic devices, however, it is noted that this limitation is drawn only to an intended use.

19. **Claim 29** is rejected under 35 U.S.C. 103(a) as being unpatentable over Petritsch (WO 99/49525) in view of Nakamura (USPN 6291763), Ago (Advanced Materials, Vol. 11, Num. 15, 1999, pages 1281-1285), and Mitra (US Patent Application Publication 2004/0256001), and further in view of Shaheen (Applied Physics Letters, Vol. 78, Num. 6, page 841). Petritsch, Nakamura, Ago, and Mitra teach the subject matter of Claim 25 above under 35 USC 103(a). **As to Claim 29**, the cited references appear to be silent to

chlorobenzene. However Shaheen teaches that a chlorobenzene-based device with thiophene is much more efficient at converting photons to electrons (page 842, right column, paragraph beginning with "A plot..."). It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Shaheen into that of Petritsch, Nakamura, Ago, and Mitra in order to provide much more efficient devices.

20. **Claims 31 and 32** are rejected under 35 U.S.C. 103(a) as being unpatentable over Petritsch (WO 99/49525) in view of Nakamura (USPN 6291763). **As to Claim 31,** Petritsch teaches a method of making films surface imprinted with nanometer-sized particles to produce micro- and/or nano-structured electron and hole collecting interfaces (Page 8 and elsewhere), comprising:

providing at least one transparent substrate (Page 9, line 7, Page 10, line 16);

providing at least one photoabsorbing conjugated polymer (Page 9, line 17);

providing a sufficient amount of nanometer-sized particles to produce a charge separation interface (Page 8, lines 9-31);

embedding said nanometer-sized particles in said conjugated polymer (Page 8, lines 13-19);

applying the transparent layer on a first said substrate to form a charge transport film layer (Page 10, first paragraph of embodiment 1);

applying said conjugated polymer/nanometer-sized particle mixture on a second said substrate to form a nanometer-sized particles bearing surface film layer, wherein said

nanometer-sized particles form a stamp surface (Page 10, first paragraph of embodiment 1);

imprinting said stamp surface into the surface of the second film layer to produce micro- and/or nano-structured electron and hole collecting interfaces (Page 8, lines 9-12 and Page 11, lines 10-21);

Petritsch appears to be silent to a) providing at least one transparent polymerizable layer including a polymer, b) polymerizing said polymerizable film layer to promote shrinkage to form a conformal gap between said stamp surface and said surface of said polymerizable film layer, and c) filling said gap with at least one photoabsorbing material to promote the generation of photoexcited electrons and transport to the charge separation interface.

However, Nakamura teaches a) providing at least one transparent polymerizable layer including a polymer (26:16-28:35), b) polymerizing said polymerizable film layer to promote shrinkage to form a gap between said stamp surface and said surface of said polymerizable film layer (26:16-36, 28:51-62), and c) filling a gap with at least one photoabsorbing material to promote the generation of photoexcited electrons and transport to the charge separation interface (12:53-66, 28:51-62).

It would have been prima facie obvious to one of ordinary skill in the art at the time of the invention to incorporate the method of Nakamura into that of Petritsch because Petritsch specifically suggests modifying the interface to improve performance (Page 13, bottom to Page 14, middle), which Nakamura provides (4:6-45) in the form of a charge separation interface.

As to Claim 32, Nakamura teaches polyaniline (28:20).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J. Daniels whose telephone number is (571) 272-2450. The examiner can normally be reached on Monday - Friday, 7:30 am - 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Colaianni can be reached on (571) 272-1196. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MJD 1/27/06

MICHAEL P. COLAIANNI
SUPERVISORY PATENT EXAMINER